Editorial

Welcome to the first CROSS-AUS Newsletter!

Following the launch of CROSS-AUS on 26 September it is pleasing to see increasing activity on our website with the first reports being submitted.

It is also very encouraging to see the large number of subscribers who have signed up to receive our email updates. A point to note is that subscribing via the website is a two-step process – after you submit your details and register on the website, you should receive an email with a link asking you to confirm your subscription. If this did not happen, it may be that your mailbox has rejected the confirmation email which is sent from structuralsafety@communicatoremail.com in which case your IT department may be able to resolve the issue; alternatively send an email to administrator@cross-aus.org.au and we will try to assist.

An important element of CROSS-AUS is that there is a Panel of experts to give comments on submitted reports together with a legal review prior to publication. We are pleased to welcome our first Panel members to CROSS-AUS and their details will be added to our People page. This panel will increase in time as needs and demands require, if you are interested in becoming a panel member please get in touch.

Confidentiality is a critical aspect of the process and all submitted reports are de-identified as described on our website before being sent to the Panel for review and comment. After collation and agreement of Panel comments, the report with comments is then sent back to the Reporter for final approval to publish.

DIRECTOR: Mike Fordyce

For this first newsletter we have decided to re-publish some previously published CROSS reports that were either submitted from Australia or make reference to practice in Australia, and that we believe are still relevant today. These are:

- Reports 254 (published 2012), 390 (published 2014) & 513 (published 2015) that relate to steel supply and fabrication issues and we invite your feedback as to whether there are ongoing similar issues today or whether there have been improvements in practice in recent years. Do let us know!

- Reports 462 & 465 (both published 2015) that relate to problems that can arise with non-structural elements when typical “residential” type construction details are used in more extreme environments typical of Australia. Have you encountered any similar problems?

We encourage you to give us feedback on any of these matters or to submit a report on any safety issues or matters of concern that you may have.

HOW TO REPORT

For more information, please visit the How to Report page.

If you have experienced a safety issue that you can share with CROSS-AUS, please Submit a CROSS-AUS Report.

If you want to submit a report by post, please send an email to administrator@cross-aus.org.au asking for instructions.

KEY

- CROSS-AUS Report
- CROSS-AUS Panel Comments
- News
- Information
- Denotes a hyperlink
254: Steel connector failures and forged certificates (2012)

REPORT

CROSS Newsletter 22 contained a report on the failure of steel fixings holding a scaffold to a building due to incorrect material being used and another about allegedly forged certificates accompanying steel plates.

This prompted a reporter to come forward with several other examples. It seems that some suppliers are receiving components that have been manufactured elsewhere and are accompanied by certificates that are potentially false or forged. Components in these cases, says the reporter, can be suspension connectors.

Most specifications used internally depend on quality assurance to demonstrate compliance with design requirements, says the reporter. This normally entails a level of non-destructive testing and possibly destructive testing to verify mechanical properties.

Proprietary products such as fasteners, tie rods or couplings are normally accepted as manufactured items and compliance is satisfied by information supplied by the manufacturer stating compliance with national specifications with no verification required. Such reliance on quality assurance alone is now being questioned following failures over the last few years.

The UK has been slow in recognising this issue which has been partially addressed in America and Australia. Many products are manufactured largely outside the UK and traded worldwide. This makes product verification far more difficult and quality documentation is essential. The problem is that documentation is often accepted without proper review.

It seems that some suppliers are receiving components that have been manufactured elsewhere and are accompanied by certificates that are potentially false or forged.

The reporter goes on to say that America recognised this issue some time ago (1999) and introduced the Fastener Quality Act (FQA) making the supplier legally responsible. This has improved the internal market in America but one consequence may be that the products are diverted to other countries which have less onerous control.

Australia has adopted the stance that the designer or consultant is responsible for issuing a specification to avoid these problems. As this will be driven essentially by quality assurance it is not clear how effective it will be as a preventative method apart from identifying the responsible party. Clearly in Australia, the Designer or Consultant needs to consider the option to specify additional testing on delivered items.

The issue of incorrectly identified, misrepresented or counterfeit products is not solely related to fasteners or products in steelwork construction. In fact it has been recognised in the aviation industry (aircraft spares traded on quality certificates), offshore construction (steel products traded on material certificates) and the onshore construction industry (steel products traded on material certificates).

This is a multi-billion pound/dollar market that can be exploited for profit. The result is a product which has properties that have not been substantiated, may have variable quality and may suffer premature failure.

It should be noted that this is not just a local issue but has global implications given that these products are now manufactured in many countries and traded worldwide. Components which have been known to fail include bolts, connector parts, castings and steel plates.

INFORMATION

What should be reported to CROSS-AUS?

Structural failures and collapses, or safety concerns about the design, construction or use of structures.

Near misses, or observations relating to failures or collapses (which have not been uncovered through formal investigation) are also welcomed.

Reports do not have to be about current activities so long as they are relevant.

Small scale events are important - they can be the precursors to more major failures.

No concern is too small to be reported and conversely nothing is too large.

Your report might relate to a specific experience or it could be based on a series of experiences indicating a trend which may require industry or regulatory action.

Benefits of CROSS-AUS

- Share lessons learned to prevent future failures
- Spurs the development of safety improvements
- Unique source of information
- Improved quality of design and construction
- Possible reduction in injuries and fatalities
- Lower costs to the industry

COMMENTS

As noted by the reporter, there are many products which rely on certification to demonstrate safety and thereby avoid or limit testing at the point of use.

These include fixings, couplers, some precast products, pre-stressing components and even reinforcement. It is essential to check that such certification is valid, current, and is relevant to the actual product being used.
used. The global nature of the market in many of these products means that there is an increased chance that non-certified products will be presented for use more through ignorance than through deliberate consideration.

In addition, the increased use of CE marking and the introduction of the Construction Product Regulations may lead to products carrying the CE mark that would not necessarily meet current certification procedures. In this change-over period the scope of any CE mark should be checked to ensure it is appropriate for the product/use concerned.

The major problems with fasteners identified in the USA fell into the following categories: improper material substitutions, falsification of certificates, inconsistent heat treatments, wrong plating materials, omission of the stress-relief processing step, mismarked or absent performance indicators, and dimensional discrepancies.

This is a serious issue which needs industry-wide action. However, in the first instance it is suggested that those in receipt of certification should ensure they are aware of the appropriate certification format and type, and have due regard to the provenance of the supply chain. Anyone with experience of such issues is invited to send them to CROSS-AUS.

CROSS-AUS NOTE: Since this Report was published in 2012, the Australian Engineered Fasteners and Anchor Council (AEFAC) has been formed with the objective to enhance the specification, selection, design and installation of structural anchors and fasteners in the Australian construction industry.

390: Fabrication issues with steelwork truss in Australia (2014)

**REPORT**

The truss structure shown, says the reporter, illustrated significant defects and deflected after erection requiring rectification.

The builder undertook repairs on site, including reinforcing the areas where cracking occurred in the junction between cross beams and main truss beams and welding reinforcing tubing alongside sections of the cross beams that had split.

This work was however deemed insufficient to stabilise the structure and as a result another tenderer was engaged to rebuild the truss. In this process the original steelwork was removed and taken to their yard.

Several additional defects and instances of non-compliance to the relevant Standards were found. Tensile testing showed the steel was 338 MPa yield strength versus a 450 MPa grade to AS/NZS 1163 Gr 450L0 called up in the engineer’s documentation.

There were also other non-compliances. These cover AS/NZS 1554 welding, and the material specification AS/NZS 1163 for the hollow sections.

**COMMENTS**

This is an abbreviated version of a much longer report and describes a structure which had numerous problems. A complex fabrication such as this needs competent input at all stages.

This report is primarily about defective workmanship and use of steel having inadequate strength but the comment about deflection after erection is curious.

Deflection is governed by design and the steel’s E value (which is not related to strength) and so perhaps there are aspects that could be related to design.

The report demonstrates that steel member capacity is just as much governed by fabrication quality as design and that all projects require adequate documentation and inspection to assure that what the designer thought was being provided was actually provided. This applies wherever the fabrication is carried out and where standards may be misconstrued. Physical examination of the processes in-situ may be advisable.

Structural-Safety has previously warned of inadequate documentation accompanying imported components: Anomalous documentation for proprietary products - February 2013.

CROSS-AUS NOTE: Since this Report was published in 2014, Australian Standard AS5131 – Structural Steel Fabrication & Erection was published in 2016 and CROSS-AUS would like to receive your feedback on any similar fabrication issues or whether practice has improved.
An Australian reporter created a design for propping required to carry out partial demolition and reconstruction of a small tower on a mine.

On a site visit for another project some time later, the reporter noticed that the propping design had been fabricated and installed but a number of connection details did not match the design drawings. The structure as fabricated effectively had no stability in one plane and there were other non-conformities.

Investigation revealed that the mine had submitted the design drawings to a fabrication company, which had then subcontracted the fabrication out to a second fabricator who had then subcontracted out the creation of shop detail drawings to yet another drafting company. Somewhere in this chain of responsibility the decision was made to standardise the end details of each member without getting approval from the design engineer. This had simplified the fabricator’s task but completely voided the design intent.

More important, however, was the lack of engineering oversight of the fabrication and construction stages of the build. In the reporter’s experience in the local mining industry, small projects such as this one are often done in three stages - design, fabrication and installation.

Typically all of these are done by different companies. They rarely interact except through the project manager from the mine site who is usually not a qualified structural engineer and often has no engineering background at all. This means that there is a lack of engineering oversight that could identify potentially dangerous modifications or construction defects.

It is always important to have engineering oversight to all areas of design and construction. The disconnect between each stage is becoming increasingly common and is leading to serious risks.

This example illustrates a lack of oversight and control, with the potential for lethal consequences. It should not happen in the UK if the CDM regulations are applied correctly and is a reminder of the Hyatt Regency catastrophe in 1981 (Investigation of the Kansas City Hyatt Regency Walkways Collapse) when 113 people were killed and 186 injured because of a difference between design and detailing.

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Safety reviews in the UK

Following the Grenfell Tower Inquiry, the UK Prime Minister commissioned a Public Inquiry into the incident which is being led by Sir Martin Moore-Bick.

In June 2017, Dame Judith Hackitt was asked by the Secretary of State for the Department for Communities and Local Government (DCLG, now MHCLG) and the Home Secretary to conduct an Independent Review of Building Regulations and Fire Safety with a particular focus on their application to high-rise residential buildings.

The final report was published in May 2018.

In July 2017, following the Grenfell Tower disaster, the Institution of Civil Engineers (ICE) commissioned an independent review to identify any action to improve public safety that should be taken by the civil engineering and infrastructure community.

The final report was published in October 2018.

Involvement of Structural-Safety

Structural-Safety, which incorporates CROSS and SCOSS (Standing Committee on Structural Safety) is working with the IStructE, ICE and government departments to examine ways of adopting the recommendations from the two published reports above into the construction industry.
The reporter has observed the occurrence of compressed fibre cement sheets becoming dislodged from the soffit of several buildings in Australia.

This lining is typically considered to be non-structural but with linings on buildings of 15 or more storeys, the risk of these falling and causing damage to people and property is considerable. Failure typically appears to be in the form of the sheeting pulling over the head of fixing screws.

The reporter believes these soffit linings are typically not being designed by a structural engineer but that installers are utilising the product design information to determine framing and screw spacing.

It is apparent from reviewing the product design information available that design tables have been provided for residential structures and conditions. In Australia these are typically categorised as being two storeys or less, so significantly different to conditions being experienced at 15 storeys or more.

The lesson to learn here, says the reporter, is that product design information should be reviewed for applicability to the conditions and, if the conditions are outside the stipulated parameters, the product application should be engineered from first principles utilising product capacity information and support from the product manufacturer.

This is similar to report 461 Metal cladding panels blowing in the wind where fixings failed due to wind vibration and it adds to the trend of problems with fixings.

The soffit panels in this case are akin to ceiling panels where there are many examples of failure. These are amongst the ‘non glamorous’ aspects of design which do not get the attention they need. Generally the applied loads are uncertain; the adequacy of the fixings is uncertain; the reliability of installation is uncertain and the consequences of failure potentially can be dire.

A sheet falling from 15 storeys could be lethal. To guard against this, designers, whether working for consultants or for contractors, must appreciate their responsibilities.

Redundancy is required and in safety-critical cases, a robust retention solution should be considered. Furthermore it is always unwise to extrapolate design aids beyond the scope for which they were originally intended.

"it is always unwise to extrapolate design aids beyond the scope for which they were originally intended"

CROSS-AUS NOTE: It is essential that designers and installers are using manufacturer’s design information that is suitable for the scenario in hand. Designers and installers are also reminded of the additional requirements when designing in cyclonic areas as called up in AS1170.2 and the National Construction Code. CROSS-AUS invites your feedback on any similar issues that you have encountered.
This reporter lives in the highest wind speed region in Australia where the working wind speed of over 250km/hour (70m/s, 155mph) and an ultimate speed of 316km/hour (90m/s, 196 mph).

His firm routinely ensures that flashing, cappings, solar hot water heaters, ridge vents, skylights, satellite dishes and other appurtenances are tested by the manufacturer for the wind loads and rated accordingly.

They must then be fixed to the roof in accordance with the manufacturer’s recommendations and the engineer must ensure that the members they are fixed to can take the uplift loads.

Roller doors and shutters and windows (including glass, frames and fixings) on walls are also areas of concern.

This is the kind of engineering recommended in the comments on the previous two reports  
461 Metal cladding panels blowing in the wind, and  
462 Non-structural roof soffit linings – failure where high, and uncertain, drag and uplift loads should be taken into account by the designer.

Any identifiable details, such as a project, product, individual or organisation, are completely confidential to CROSS-AUS. Reporters’ personal information is collected to verify the contents of the report, and to communicate with the reporter, but this also remains confidential.